

# South/Mid Ceredigion Water Supply

## curing shortfall now & catering for predicted 25 yrs growth

**T**he South/Mid Ceredigion Resource Zone is currently supplied by two principal sources, the Teifi Pools and the River Teifi at Llechryd, serving a population of some 52,000 customers in West Wales. This area, which is predominantly rural, includes the towns of Lampeter, Cardigan, Aberaeron and New Quay. The shortfall in water supply within this zone, which is significant over the summer period, is predicted to grow over the next 25 years. The South/Mid Ceredigion Water Supply Scheme was developed to meet current and future demand for potable water in the Ceredigion region of Wales.



Aerial view of Strata Florida Water Treatment Works

*courtesy: Welsh Water Capital Alliance*

The scheme consisted of the following components:

- \* transfer of up to 7 million litres per day (Ml/d) of raw water from Claerwen Reservoir to Strata Florida WTW;
- \* expansion of Strata Florida (WTW) from 8Ml/d to 13Ml/d;
- \* improvements to increase capacity of the Teifi Valley trunk main from 9Ml/d to 13Ml/d;

Supply shortfalls were highlighted by the drought in 1995 when, at peak, 2.5 million litres per day (ml/d) of potable water was needed to be tankered into the area. In addition, at certain times of the year, water abstracted from the Teifi Pools is of a poor quality, requiring extended treatment to achieve an acceptable quality. During these periods the output from Strata Florida WTW was reduced from 8ml/d to 5ml/d, imposing heavier demands on the rest of the network. The future demand is a result of the proposed inward investment for South Ceredigion, which is supported by the Welsh Development Agency (WDA), which has agreed to support the

scheme through European Objective 1 grant funding.

Upgrading of the Strata Florida supply system overcomes a water resource shortfall in Mid/South Ceredigion and minimises the demand for water from the pumped Llechryd system, which abstracts water from the River Teifi. Strata Florida WTW was originally constructed in 1961, and has been the subject of previous upgrading schemes in 1970 and 1993/94. The original treatment works was a pressurised system, designed to operate on the difference in head between the Teifi Pools and the downstream Strata Florida Service Reservoir. Raw water gravitated from the Teifi Pools impounding reservoirs, and was treated using a process of coagulation, followed by two stages of pressure filtration.

The first stage was to upgrade the existing Strata Florida WTW from its original design output of 8ml/d to a sustainable output of 13ml/d, to overcome current supply shortfalls and meet future demand. Although the Teifi Pools, under normal conditions, are capable of meeting a current demand of 8ml/d, they were unable to continuously meet the future demand of 13ml/d.



Clawren Reservoir

courtesy: Welsh Water Capital Alliance

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**It was, therefore, resolved that the existing raw water supply from the Teifi Pools would be augmented by providing an additional raw water supply of up to 7ml/d from Claerwen Reservoir through a dedicated 18km transfer main.**

The original proposal to expand the capacity of Strata Florida WTW involved increasing the number of primary and secondary filters, and expanding the capacity of the wastewater handling plant. However, during periods of high raw water colour, filtrate quality deteriorates and it was concluded that the existing process train would be unable to satisfy the changing requirements of Strata Florida WTW. Of the alternative process options considered, dissolved air flotation (DAF) was selected as a robust process solution.

### **New process solution**

Raw water from the new Claerwen main and existing mains from the Teifi ponds is blended in a new inlet/break pressure tank. After coagulation, the flow is split evenly between four DAF streams.

To minimise footprint the Dissolved Air Flotation (DAF) streams are constructed as concrete shells, each divided into a two stage flocculator and DAF cell using internal stainless steel baffles. Propeller type flocculation mixers are used. The DAF recycle water is introduced into the flow using WRC-type nozzles. DAF sludge is removed hydraulically and processed with settled waste water sludge using the existing sludge thickener.

Due to hydraulic constraints within the site, clarified water is pumped to the existing seven horizontal pressure filters. To minimise damage to residual floc, low shear pumps were specified and a facility provided to dose polyelectrolyte. The filters were modified to include flow control of the outlet valves to improve flow distribution and space out backwashing. Primary filtrate is discharged to a new atmospheric chlorine contact tank. New variable speed booster pumps re-lift the flow through the existing chlorine contact pressure vessel, manganese removal pressure filters and into distribution. To accommodate the increased plant throughput, the number of secondary filters was increased from four to six.

A particular challenge during commissioning was changing the operation of the primary pressure filters from high-pressure to a low-pressure system, while maintaining plant throughput.

The existing waste water treatment process, comprising a waste water lamella and WRC-type thickener, is retained. Despite the increase in plant throughput, the addition of the DAF process has increased filter run times and significantly reduced wastewater discharges. Thickened sludge was previously tankered to another site for dewatering but, to minimise transport costs, a new centrifuge has been added.

Existing chemical storage and handling equipment for sodium carbonate, polyaluminium chloride, lime, chlorine and ammonia gas was retained, and upgraded where necessary for the increased plantflow.

### **Improvements to existing trunk main**

Strata Florida WTW supplies the Teifi Valley Trunk Main, which feeds the local distribution network, and Rhosymyrson and Penuwch Service Reservoirs. For the increased demand to reach the specific reservoirs, two booster pumping stations were required, a new greenfield development at Deri Goch near Lampeter (to feed Rhosymyrson), and a fully refurbished station at Penuwch to feed its related reservoir.

The proposals will enable the transfer of spare capacity from the Strata Florida system to the Llechryd system via Rhosymyrson SR, and in very unusual circumstances, the transfer of flow from Rhosymyrson to the north.

The agreed solution is to build a bi-directional pumping station at Deri-Goch with an output of up to 8.0ml/d to Rhosymyrson SR. The pumping station will be rated up to 8.0ml/d, and will comprise duty/standby variable speed pump sets.

In addition, the solution included for the refurbishment and upgrading of Penuwch PS, to provide up to 3.5ml/d potable water to Penuwch SR. The pumping station is rated at 3.5ml/d, and will comprise duty/standby variable speed pump sets.

### **Claerwen Transfer Main**

The route of the proposed Claerwen to Strata Florida pumping main has been designed to minimise the environmental impact on protected Special Protection Area (SPA) and Sites of Special Scientific Interest (SSSI) within the Elan Valley. The decision to utilise indigenous materials within the works demonstrates the sustainable, cost effective engineering solutions that have been proposed for this environmentally sensitive scheme.

The proposed solution is to lay approximately 18km of 300mm diameter HPPE main between Claerwen Pumping Station, located adjacent to the reservoir, and Strata Florida WTW. Approximately 6km of the proposed pipeline will run through an SSSI, but avoids a candidate Special Area for Conservation (cSAC) by diverting into the Tywi Forest, following the forestry track where practicable.

### **The proposals include for:-**

A low level connection to the Claerwen reservoir, utilising existing pipework within the dam structure to ensure that water is available for transfer, regardless of impounded levels in the reservoir. The pipework will be integrated within the external structure of the dam and run below ground to the pumping station to minimise visual impact. The underground pumping station will house two variable speed pumps (duty/standby), motor control centre and telemetry equipment.

The Claerwen Transfer Main was subject to planning approval, which was granted following the completion of a comprehensive Environmental Impact Assessment (EIA) and wide ranging discussions with the Countryside Council for Wales (CCW), Environment Agency and Elan Valley Trust.

A budget of £0.10m has been allocated in the scheme costs for a power supply to Claerwen PS, using hydroelectric power, generated at Claerwen Reservoir. This local green energy source exports power to the National Grid via an existing cable and an agreement is to be reached, whereby the pumping station can be directly connected to the outgoing power cable. The alternative solution would be to lay a dedicated supply cable from the nearest national grid location, a distance of some 6 miles. Dwr Cymru Welsh Water are also in negotiations with Severn Trent Water Authority, the EA and CCW, regarding the abstraction of water from Claerwen Reservoir, which could have an impact on the security of supply in the Severn water resource zone, covering substantial areas of Birmingham and the West Midlands. ■

**Note:** *The Editor & Publishers thank Welsh Water Capital Alliance for preparing the above article.*